

Title: A longitudinal study of policy effect (smoke-free legislation) on smoking norms: ITC Scotland/UK

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Abstract

The longitudinal ITC Scotland / UK survey was used to investigate adult smokers' support for smoke-free legislation, and whether this support was associated with higher quit intentions at follow-up; either directly, or indirectly, via the mediation of perceived social unacceptability of smoking. Structural equation modeling was employed to compare differences between the two samples (507 adult smokers from Scotland and 507 from the rest of the UK) across two waves (February/March 2006 and March 2007). During these two waves a smoking ban was introduced in Scotland, but not the rest of the UK. For smokers in both samples, support for smoke-free legislation at baseline significantly heightened perceived unacceptability of smoking, although perceptions of unacceptability were somewhat stronger in Scotland than the rest of the UK post-ban. Unlike the rest of the UK, support for a ban at baseline among smokers in Scotland was associated with higher quit intentions at follow-up. For both samples, quit intentions were significantly associated with heightened perceived unacceptability at follow-up. The overall variance explained in quit intentions was greater in Scotland than in the rest of the UK, but not significantly so. Support for smoke-free legislation at baseline significantly increased support at follow-up for both samples. However, this did not independently increase quit intentions among smokers from both Scotland and the rest of the UK. The findings suggest that normative influences are one of the mechanisms through which comprehensive smoke-free legislation influence quit intentions.

Keywords: Normative influences; Smoking bans, Structural equation modeling

Introduction

The recent decline in smoking prevalence in most advanced tobacco markets has been attributed to a synergism of tobacco programs and policies (Siegel, Albers, Cheng, Biener, & Rigotti, 2004; Tauras, 2005; Tauras & Chaloupka, 2001; Wilson et al., 2007). A central component to any comprehensive tobacco control program is smoke-free legislation (Levy, Chaloupka, & Gitchell, 2004), with restrictions in pubs, restaurants and other workplaces associated with reduced smoking prevalence and increased smoking cessation, among both adults and young people (Fichtenberg & Glantz, 2002; Gallus et al., 2006; Levy, Friend, & Polishchuk, 2001; Tauras, 2005; Wakefield et al., 2000). For example, 46% of adult smokers in Ireland reported that they were more likely to consider quitting on account of the smoking ban, introduced in 2004, whilst 80% of quitters indicated that the ban helped them to quit and 88% to stay quit (Fong et al., 2006). Smoke-free legislation conveys additional benefits, including the imposition of smoke-free restrictions in the home (Hyland et al., 2007) and improved air quality in hospitality settings (Edwards et al., 2008), thus protecting workers and non-smoking patrons from second hand smoke (IARC, 2004).

It is evident from the extant literature that comprehensive smoke-free legislation, covering all indoor areas, is capable of reducing smoking prevalence (Chapman et al., 1999; Eriksen & Chaloupka, 2007; Gallus et al., 2007; Levy et al., 2001; Tauras, 2005; Wilson et al., 2007). In fact, along with high tobacco taxation, comprehensive smoke-free laws may represent one of the most effective tobacco control measures available (Fichtenberg & Glantz, 2002; Levy, Chaloupka, & Gitchell, 2004). Surprisingly however, despite the direct link between smoking restrictions and reduced prevalence and intensity, the mechanisms mediating this effect, such as normative influences, are under-researched (Albers, Siegel, Cheng, Biener, & Rigotti, 2004). More than most other tobacco control measures, smoke-free legislation can denormalise tobacco use by transforming smoking norms and accelerating

approval of a non-smoking environment as the prevailing norm (Kagan & Skolnick, 1993; Opp, 2002; Ostrom, 2000). For example, research has provided evidence of changing norms about smoking concomitant with smoking restrictions in the workplace (Gilpin, Lee, & Pierce, 2004; Shopland, Gerlach, Burns, Hartman, & Gibson, 2001). As smokers conform to non-smoking directives in workplaces this may result in stronger anti-smoking norms, by reducing smoking visibility in these settings and encouraging societal disapproval of smoking (Alesci, Forster, & Blaine, 2003; Eisenberg & Forster, 2003; Siegel, Albers, Cheng, Biener, & Rigotti, 2005).

Another mechanism via which smoking restrictions can denormalise tobacco use is through increased social unacceptability of smoking. Research has incorporated normative influences, such as social unacceptability, in behavioral models and found that this measure correlates with, and strongly predicts a range of behaviors, including smoking (Armitage & Conner, 2001; Eisenberg & Forster, 2003; Hamilton, Biener, & Brennan, 2008). It has also been found to predict quit intentions and behaviours (Dotinga, Schrijvers, Voorham, & Mackenbach, 2005; Alamar & Glantz, 2005). Research that has assessed the extent to which smoking restrictions influence normative influences, such as acceptability (Albers et al., 2004; Gallus et al., 2007), are generally limited to cross-sectional data however, thus preventing causal associations being drawn between smoke-free regulation and changes in acceptability of smoking. A notable exception is Albers, Siegel, Cheng, Biener, & Rigotti's (2007) longitudinal research assessing the effect of (weak or strong) smoking regulations in local restaurants, across 351 towns in Massachusetts, on adult smokers' perceived acceptability of smoking and quit behaviors (quit attempts and actual cessation). For smokers who had already attempted to quit at baseline, living in a town with strong regulations increased the odds of making a quit attempt at follow-up (OR = 3.1). And for smokers perceiving smoking as unacceptable at baseline, smoke-free regulations appeared to

consolidate these initial beliefs, but in neither case were local regulations found to have an effect on cessation at follow-up. The fact that local smoke-free regulations were weak in the vast majority (87.5%) of towns provides a possible explanation for the failure to find increases in cessation.

In this study we add to the tobacco control literature by assessing whether adult smokers' quit intentions are associated with support for smoking restrictions and social unacceptability following a comprehensive smoking ban in Scotland, by legitimizing non-smoking as a societal normative behavior by making smoking more unacceptable (Gruber & Zinman, 2000; Wakefield et al., 2000). Knowledge of the role of normative influences on quit intentions, if any, can contribute to the design of media campaigns, occurring alongside smoke-free legislation, aimed at promoting quitting. Specifically, we examine: (1) the effect of a policy related measure (support for smoke-free legislation) on adult smokers' perceived social unacceptability of smoking, one month pre-ban and one year post-ban; and (2) whether support for smoke-free legislation, and perceived social unacceptability of smoking, are associated with quit intentions post-ban. We extend Albers et al. (2007) study in three ways; first, we use nationally representative samples of smokers; second, we assess comprehensive smoke-free laws that cover, without exception, an entire nation (i.e. the legislation covers all of Scotland, with no local level regulatory variations); and third, we use the rest of the UK as a control group. This enables comparisons to be drawn with these countries that have, aside from smoke-free laws, very similar tobacco control policies to Scotland at the time of the study. In terms of smoke-free laws, a comprehensive nationwide smoking ban, including restaurants and public houses (pubs), came into effect in Scotland in March 2006. For the rest of the UK, smoke-free legislation was implemented approximately twelve to fifteen months after the Scottish ban.

Methods

Sample and procedure

The ITC Scotland/UK Survey was a quasi-experimental longitudinal telephone survey using nationally representative samples of both smokers and non-smokers, aged 18 years or older, in Scotland and the rest of the UK. Participants were part of a larger cohort study conducted as part of the ITC Policy Evaluation Project (Fong et al., 2006). These participants were recruited by geographically stratified probability sampling with telephone numbers selected at random from the population of each country. List assisted telephone numbers comprising a sampling frame of 100-banks (defined by area code, three-digit prefix, and first two digits of the four-digit suffix, such as the 100 consecutive numbers from 0141-936-0000 to 0141-936-0099) of residential numbers were obtained from Survey Sampling International. The next birthday method was used to select a single respondent in households with more than one eligible respondent (Binson, Canchola, & Catania, 2000). A smoker was defined as an individual who reported smoking at least once in the month prior to interview and had smoked at least 100 cigarettes in their lifetime.

The two samples (Scotland and the rest of the UK) were interviewed one month before the smoking ban came into effect in Scotland on March 2006, and one year later. At follow-up, smoking bans in the rest of the UK had not yet been implemented, although they were imminent. Results are weighted to be representative of the adult smoker population within each country. Smokers received a £7 shopping (Boots) voucher as an incentive to participate while non-smokers received a £4 Boots voucher. For this study, only smokers are included in the analyses.

The total sample comprised 1,014 smokers at baseline (507 from Scotland and 507 from the rest of the UK), see table 1 for age and gender classification. The response rate at baseline was 29% in Scotland and 30% in the rest of the UK. The retention rate for Scotland

and rest of the UK was 53% and 51% respectively at the follow-up survey and included 527 smokers. Analysis between responders and non-responders on demographic information (age, gender and SES) found non-responders from both countries more likely to be between the ages of 25 and 54, although no significant differences in gender and SES were found (see table 2). The study protocol was approved by ethics review boards at the University of Stirling (Scotland), University of Waterloo (Canada), Roswell Park Cancer Institute (United States) and the Cancer Council Victoria (Australia).

< Insert Table 1 about here >

< Insert Table 2 about here >

Measures

Policy specific measures

Perceptions of Smoking Restrictions

Two policy-related items were employed to create a single index to measure the level of support for smoking restrictions in public houses. The first item: 'Do you support or oppose a total ban on smoking inside pubs' was measured on a 4-point scale ranging from 'strongly support' to 'strongly oppose'. The second item: 'Do you think that bans on smoking in pubs are a good thing or bad thing' was measured on a 4-point scale ranging from 'very bad' to 'very good'. Cronbach alpha for this construct was .87 and .82 for waves one and two respectively.

Psychosocial mediator

Social Unacceptability of Smoking

Three items were used to create a single index to measure the social unacceptability of

smoking among proximal groups (People who are important to me believe I should not smoke), society in general (Society disapproves of smoking) and self-perception of unacceptability (There are fewer and fewer places where I feel comfortable smoking). Each item was assessed using a 5-point Likert scale, ranging from 'strongly agree' to 'strongly disagree'. Cronbach alpha was .62 and .60 for waves one and two respectively.

Outcome measure

Quit Intentions

Intention to quit was assessed (at wave 2 only) with a standard question based on the stages of change model (de Vries & Mudde, 1998; Prochaska, Redding, & Evers, 1997). The question asked how soon participants planned to quit smoking, with a 4-point scale ranging from 'plan to quit smoking within the next month' to 'not planning to quit', which was collapsed into dichotomous responses 'yes, intend to quit' or 'no, not intending to quit'.

Analytic Strategy

The hypothesized model, which tests the relations among the latent factors (independent, mediating, and dependent variables), was analyzed using structural equation modeling (SEM) with Analysis of Moment Structures (AMOS; Arbuckle & Wothke, 2003). SEM permits simultaneous assessment of a range of relations among constructs and rigorously examines and compares similarities as well as differences between two or more groups (Hoyle, 1995). AMOS provides full maximum likelihood estimates and presents a means of controlling for the presence of measurement errors (Hoyle & Smith, 1994; Joreskog & Sorbom, 1998).

Prior to testing the structural models for both Scotland and the rest of the UK, the viability of our proposed latent factors was established using confirmatory factor analysis (CFA; Joreskog & Sorbom, 1998). CFA seeks to determine if the number of latent factors and

the loadings of indicator variables on them conform to what is empirically expected (Kim & Mueller, 1978b). The latent factors comprise all unobserved variables (e.g. support for smoking restrictions) which are measured by their respective observed variables (e.g. people who are important to me believe I should not smoke).

Statistical tests to evaluate model fit were based on the normed fit index (NFI; Bentler & Bonett, 1980), comparative fit index (CFI; Bentler, 1990), Tucker Lewis Index (TLI; Browne & Cudeck, 1993) and root mean square error of approximation (RMSEA; Browne & Cudeck, 1993). Values above .90 on the NFI, TLI, and CFI, and values less than .05 for RMSEA, signify good fit (Browne & Cudeck, 1993). Chi squared is reported but, as it is sensitive to sample size, it was used to evaluate the relative differences in fit among competing models (Hoyle, 1995).

The consistency of the measurement model across group and time was established sequentially in harmony with Bollen's (1989) guidelines. Following evaluation of the measurement model, further analyses were conducted to examine the structural models that reflect hypothesized relationships among the latent variables (see figure 1). This hypothesized model was compared against a series of alternative models using multi-group analyses to examine the consistency of the model across different groups (i.e. Scotland and the rest of the UK) along a continuum (Bollen, 1989).

<Insert Figure 1 about here >

Results

Support for a smoking ban and unacceptability of smoking

To help contextualize the subsequent models for Scotland and the rest of the UK, Table 3 shows the latent variables (support for smoke-free legislation and perceived unacceptability

of smoking) across waves 1 and 2, for Scotland and the rest of the UK. The items representing unacceptability and support were initially summed and averaged before paired sample t-tests were performed to assess any difference within and between countries at waves 1 and 2.

Within country results showed a significant difference between support for a ban from waves 1 to 2 in both Scotland and the rest of the UK. Likewise, a significant difference was found for unacceptability in both Scotland and the rest of the UK between the two waves (see table 3). Correlational analyses also revealed significant associations ($p < .01$) for both Scotland and the rest of the UK for support for a ban and unacceptability. Comparing the two countries, it was found that there were no significant differences between Scotland and the rest of the UK for both unacceptability and support for a ban at wave 1. At wave 2 there was no significant difference between Scotland and rest of the UK for unacceptability, although a higher increase in unacceptability was observed in Scotland. However, there was a significant difference between Scotland and the rest of the UK for support for a ban at wave two, with a greater increase in levels of support in Scotland.

<Insert Table 3 about here >

Evaluation of Measurement Models

The evaluation of the multi-group models' robustness was judged on the basis of (a) the appropriateness of the direction, strength, and the significance of the parameter estimates, (b) the convergence of the maximum likelihood estimate, (c) the statistical tests and fit indices previously noted (NFI, TLI, CFI, RMSEA), (d) a comparison of the constrained model with the unconstrained counterpart using the chi square difference test, RMSEA, and the CFI change, and (e) the model's ability to explain the variance of quit intentions in both samples

at follow-up.

Two identical measurement models, one for the Scottish sample and one for the sample from the rest of the UK, were tested separately. All variable loadings on the hypothesized latent factors were significant ($p < .01$). Overall fit was good for both the Scotland model ($\chi^2_{29} = 72.269$, $p < .001$, CFI = .97, TLI = .95, NFI = .96, RMSEA = .04) and the model for the rest of the UK ($\chi^2_{29} = 105.629$, $p < .001$, CFI = .95, TLI = .91, NFI = .94, RMSEA = .05). Following this, multi group analysis was used to simultaneously assess the invariance across the two countries. Multi group invariance test permits the assessment of the goodness of fit of a baseline model with all factor loadings unconstrained across the two countries compared to a constrained model. The chi-square value of the constrained model was compared with that of an unconstrained model which had no equality constraints imposed. This result indicated statistically significant group differences in the factor loadings for Scotland and the rest of the UK ($\Delta \chi^2_{13} = 23.779$, $p < .05$).

Evaluation of Structural Model

Having established group difference, the hypothesized structural model, assessed separately for Scotland and the rest of the UK, was used to examine the goodness of fit (figure 1). Good overall fit was found for both the Scottish ($\chi^2_{36} = 78.765$, $p < .001$, CFI = .96, TLI = .93, NFI = .94, RMSEA = .04) and the rest of the UK models ($\chi^2_{36} = 91.910$, $p < .001$, CFI = .94, TLI = .90, NFI = .91, RMSEA = .05). Subsequently, all path coefficients of these structural models were constrained to be identical across the two groups, which were then compared with an unconstrained model. Results of a chi-square difference test ($\Delta \chi^2_{16} = 34.53$, $p < .01$) indicated that the unconstrained model fit the data significantly better. This shows there are differences in the path coefficients for smokers in Scotland and the rest of the UK. Finally,

the consistency of the structural model over time was tested by comparing the constrained path coefficients linking baseline and follow-up variables with an unconstrained model in which these coefficients were estimated freely. The chi-square difference test indicated that the unconstrained model fit the data better than the constrained model ($\Delta \chi^2_8 = 16.336, p < .05$). Thus, there is significant difference in the structural paths across time. A further test of invariance to pinpoint where these significant structural paths lie revealed no significant difference in structural paths from support for a ban at baseline and social unacceptability at follow-up to quit intentions between Scotland and the rest of the UK (chi-squared difference values are: $\Delta \chi^2_9 = 17.0, p = .05$ and $\Delta \chi^2_8 = 15.70, p = .05$ respectively). This suggests that there is no significant difference in quit intentions between Scotland and rest of the UK. However, between the two countries significant differences were found between the paths from support for a ban at baseline to support for a ban follow-up ($\Delta \chi^2_7 = 14.80, p < .05$), and from social unacceptability at baseline to unacceptability at follow-up ($\Delta \chi^2_8 = 15.91, p < .05$).

Comparative Evaluation of Models

Table 4 shows the standardized path coefficients (i.e. standardized regression weights) among latent variables, with both the Scotland and UK models assessed separately. Results indicate that in Scotland support for the smoking ban significantly heightened social unacceptability of smoking at baseline ($\beta = .19$). Similarly, the path linking social unacceptability at baseline to social unacceptability at follow-up was significant ($\beta = .75$). Thus, smoking was significantly less socially acceptable at follow-up as a result of the indirect effect of support for a smoking ban. The path from unacceptability at follow-up to quit intentions at follow-up was significant ($\beta = .20$) and the path from support for a ban at baseline was significantly

associated with quit intentions at follow-up ($\beta = .21$). Likewise, support for a ban at baseline also significantly increased support for a ban at follow-up ($\beta = .68$). This finding indicated that the model accounted for 19% of variance in quit intentions at follow-up. The independent paths from support for the ban at baseline and follow-up to social unacceptability at follow-up, as well as support for a ban at follow-up to quit intentions were not significant in Scotland. The overall model provided good fit ($\chi^2_{35} = 68.152, p < .001$, CFI = .97, TLI = .94, NFI = .94, RMSEA = .04).

In the rest of UK, the hypothesized structural model revealed that support for a ban at baseline heightened social unacceptability at baseline ($\beta = .26$) which, in turn, significantly heightened social unacceptability at follow-up ($\beta = .71$). Support for a ban at baseline also significantly increased support for a ban at follow-up ($\beta = .62$), though this did not independently increase quit intentions at follow-up. Rather, social unacceptability at follow-up was associated with quit intentions at follow-up ($\beta = .19$). The independent paths from support for a ban at baseline and follow-up did not affect quit intentions and unacceptability at follow-up. Although the overall fit of the model was good ($\chi^2_{35} = 77.002, p < .001$, CFI = .95, TLI = .91, NFI = .92, RMSEA = .05) the variance explained by the predictors of quit intentions (12%) was less than the variance explained in the Scottish model (19%).

<Insert Table 4 about here >

Discussion

Evidence suggests that smoking restrictions are accompanied by quitting intentions and behaviours, and help denormalise smoking (Wakefield et al., 2000; Albers et al., 2004). We sought to develop a theoretical model and test the influence of smoke-free legislation on adult

smokers' quit intentions through the mediation of normative beliefs of smoking. Our findings are consistent with the Focus Theory of Normative Conduct, which predicts that individuals will conform to a relevant norm, provided it is prominent in their consciousness (Cialdini, Kallgren, & Reno, 1990, 1991; Cialdini & Goldstein, 2004). In our study, prior to the smoking ban in Scotland, support for a ban significantly heightened smokers' perceived social unacceptability of smoking, and further strengthened these perceptions post-ban. To the extent that the relevant norm (in this case a non-smoking directive) is focal or salient, increased unacceptability of smoking would be expected, possibly through media portrayals and peer communication about the implementation of smoke-free laws (Cialdini & Trost, 1998; Real & Rimal, 2007). Our results provide evidence that smokers' perceptions of non-smoking directives at baseline can transform their smoking norms, which legislation serves to reinforce. These findings support previous research demonstrating a link between approval of bans and perceptions of smoking as less normative (Albers et al., 2007; Borland, Mullins, Trotter, & White, 1999; Trotter, Wakefield, & Borland, 2002); which are propagated in peer networks, through communication about the relevant norm (Perkins, 1997; Real & Rimal, 2007).

Similar findings were obtained for smokers in both Scotland and the rest of the UK in terms of changes in social unacceptability of smoking. However, social unacceptability of smoking among smokers in Scotland post-ban was slightly greater than for smokers in the rest of the UK. Thus, as the normative directive (i.e. smoke-free legislation) became evident in Scotland post-ban, smokers in Scotland possibly perceived smoking as more socially unacceptable than smokers from the rest of the UK, which had no ban at the time.

Comparable with the rest of the UK, in Scotland perceived social unacceptability of smoking at follow-up was associated with higher quit intentions. This finding is consistent with several studies which have found perceived social acceptability of smoking among

referent groups to be independently associated with both strength of intention to quit, and actual quit behavior, at follow up (de Vries, Mudde, Dijkstra, & Willemsen, 1998; Dotinga et al., 2005; Hammond, Fong, Zanna, Thrasher, & Borland, 2006). Nonetheless, as there was no significant difference in quit intentions between two countries, this association with quit intentions is perhaps indicative of the filtering effects of the Scottish ban coupled with media depictions about the enactment of smoke-free laws in the rest of the UK, which were implemented in summer 2007. To the extent that a non-smoking directive is enacted, quit intentions and behaviors will be largely guided by normative considerations and this will likely impact upon neighboring environments, especially on account of media campaigns and accessibility to and from both settings.

Our study also found that in the rest of the UK, support for a ban at baseline significantly increased support for a ban at follow-up, although support had no effect on quit intentions at follow-up. That support for a ban at follow-up did not affect quit intentions is perhaps suggestive of the strength of perceived unacceptability to influence quit intentions in a country preparing to introduce a ban rather than support for a ban. Likewise, among smokers in Scotland, support for a ban increased post-ban, but quit intentions at follow-up was associated with support for a ban at baseline rather than support for a ban at follow-up. This increase in support for a ban, and corresponding association with quit intentions, at follow-up may be partly due to the marked decreases in secondhand smoke evident in Scottish pubs (Semple, Creely, Naji, Miller, & Ayres, 2006). The variance in quit intentions at follow-up explained in Scotland was greater (19%) than that for the rest of the UK (12%) but this difference was not significant, similar in this respect to the findings of a recent Scotland/UK ITC study that compared smoking cessation indicators and exposure to second hand smoke in a range of venues between Scotland and the rest of the UK (Hyland et al., in press). These findings reflect the effectiveness of smoking bans, whether implemented or due

to be implemented, in influencing quit intentions, and supports the view that smoke-free laws should be a public health priority for legislators (Edwards et al., 2008).

Like all research, our study has limitations. Our model did not include moderator variables (i.e. general demographic information), which may have impacted upon the findings, although we found no significant gender differences in additional analyses (not reported). The failure to include other potential mediating variables (e.g. reduced opportunity to smoke in the workplace, dislike of smoking outside, associated mass media campaigns and unpaid media coverage) may have similarly impacted upon the findings, and the absence of other normative constructs weakened the explanatory power of the model. Additionally, a relatively small sample size was employed as a result of the low response rate, and almost half the sample was lost to attrition at follow-up, which is slightly higher than with other research (Albers et al., 2007). Furthermore, we found significant differences between respondents and non-respondents in terms of age, with smokers aged 25 to 54 more likely to dropout. This may have impacted upon the results although past research reporting similar response bias in terms of age suggests that this does not affect the conclusions drawn from these studies (Benfante, Reed, MacLean, & Kagan, 1989; Forthofer, 1983; Heilbrun, Nomura, & Stemmermann, 1991).

Despite these limitations, the use of a longitudinal design allowed us to assess the influence of a population-level policy measure (smoking ban) on quit intentions via a suitable general mediator (unacceptability). Longitudinal designs can overcome many of the problems associated with cross-sectional research and allow causality to be demonstrated, permitting valuable insights into the pathways involved in behavior change. Our findings shed light on how a smoking ban can increase the social unacceptability of smoking, which, in turn, is associated with quit intentions. Future research using tobacco industry perceptions as an additional normative mediator, aside from unacceptability, would be of value to examine

whether smoke-free legislation influences quitting partly via the creation of less favorable industry perceptions.

Funding

Funding for this research was provided by grants from the National Cancer Institute of the United States (through the Roswell Park Trans-disciplinary Tobacco Use Research Center, P50 CA111236), the Canadian Institutes of Health Research (79551), Cancer Research UK (C312/A3726), the Flight Attendant Medical Research Institute, NHS Health Scotland, and the Scottish Executive. No funder has reviewed the contents of this manuscript prior to its submission for publication.

References

- Alamar, B., & Glantz, S. A. (2006). Effect of increased social unacceptability of cigarette smoking on reduction in cigarette consumption. *American Journal of Public Health, 96*, 1359-63.
- Albers, A. B., Siegel, M., Cheng, D. M., Biener, L., & Rigotti, N. A. (2004). Relation between local restaurant smoking regulations and attitudes towards the prevalence and social acceptability of smoking: A study of youths and adults who eat out predominantly at restaurants in their town. *Tobacco Control, 13*, 347-55.
- Albers, A. B., Siegel, M., Cheng, D. M., Biener, L., & Rigotti, N. A. (2007). Effect of smoking regulations in local restaurants on smokers' anti-smoking attitudes and quitting behaviours. *Tobacco Control, 16*, 101-106.
- Alesci, N.L., Forster, J. L., & Blaine, T. (2003). Smoking visibility, perceived acceptability, and frequency in various locations among youth and adults. *Preventive Medicine, 36*, 272–81.
- Arbuckle, J. L., & Wothke, W. (2003). *AMOS 5.0 user guide*. Chicago: SPSS.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behavior: A meta-analytic review. *British Journal of Social Psychology, 40*, 471–499.
- Benfante, R., Reed, D., MacLean, C., & Kagan, A. (1989). Response bias in the Honolulu heart program. *American Journal of Epidemiology, 130*, 1088-1100.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107, 238-246.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588-606.

Binson, D., Canchola, J. A., & Catania, J. A. (2000). Random selection in a national telephone survey: A comparison of the Kish, next-birthday, and last-birthday methods. *Journal of Official Statistics*, 16, 53–60.

Bollen, K. A. (1989). *Structural equations with latent variables*. New York: Wiley.

Borland, R., Mullins, R., Trotter, L., & White, V. (1999). Trends in environmental tobacco smoke restrictions in the home in Victoria, Australia. *Tobacco Control*, 8, 266–271.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Ed.), *Testing structural equation models* (pp.136-162). Newbury Park, CA: Sage.

Chapman, S., Borland, R., Scollo, M., Brownson, R. C., Dominello, A., & Woodward, S. (1999). The impact of smoke-free workplaces on declining cigarette consumption in Australia and the United States. *American Journal of Public Health*, 89, 1018-1023.

Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity.

Annual Review of Psychology, 55, 591- 622.

Cialdini, R. B., & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske, and G. Lindzey (Ed.), *The Handbook of Social Psychology* (pp. 151-192). Boston: McGraw-Hill.

Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58, 1015-1026.

Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. *Advances in Experimental Social Psychology*, 24, 201-234.

de Vries, H., & Mudde, A. N. (1998). Predicting stage transitions for smoking cessation applying the attitude social influence efficacy model. *Psychology and Health*, 13, 369–385.

de Vries, H., Mudde, A. N., Dijkstra, A., & Willemsen, M. C. (1998). Differential beliefs, perceived social influences, and self-efficacy expectations among smokers in various motivational phases. *Preventive Medicine*, 27, 681-689.

Dotinga, A., Schrijvers, C. T. M., Voorham, A. J. J., & Mackenbach, J. P. (2005). Correlates of stages of change of smoking among inhabitants of deprived neighborhoods. *European Journal of Public Health*, 15, 152-159.

Edwards, R., Thomson, G., Wilson, N., Waa, A., Bullen, C., O'Dea, D. et al. (2008). After the smoke has cleared: Evaluation of the impact of a new national smoke-free law in New Zealand. *Tobacco Control*, 17, e2.

Eriksen, M., & Chaloupka, F. (2007). The economic impact of clean indoor air laws. *A Cancer Journal for Clinicians*, 57, 367-378.

Eisenberg, M. E., & Forster, J. L. (2003). Adolescent smoking behavior: Measures of social norms. *American Journal of Preventive Medicine*, 25, 122–128.

Fichtenberg, C. M., & Glantz, S. A. (2002). Effect of smoke-free workplaces on smoking behaviour: Systematic review. *British Medical Journal*, 325, 188-191.

Fong, G. T., Cummings, K. M., Borland, R., Hastings, G., Hyland, A., Giovino, G. A. et al. (2006). The conceptual framework of the International Tobacco Control (ITC) Evaluation Project. *Tobacco Control*, 15 (Suppl 3), iii3-iii111.

Fong, G. T., Hyland, A., Borland, R., Hammond, D., Hastings, G., McNeill, A. et al. (2006). Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive smoke-free workplace legislation in the Republic of Ireland: Findings from the ITC Ireland/UK survey. *Tobacco Control*, 15(Suppl.3), iii51-iii58.

Forthofer, R. N. (1983). Investigation of nonresponse bias in NHANES 11. *American Journal of Epidemiology*, 117, 507-515.

Gallus, S., Zuccaro, P., Colombo, P., Apolone, G., Pacifici, R., Garattini, S. et al. (2006). Effects of new smoking regulations in Italy. *Annals of Oncology*, 17, 346-347.

Gallus, S., Zuccaro, P., Colombo, P., Apolone, G., Pacifici, R., Garattini, S. et al. (2007). Smoking in Italy 2005–2006: Effects of a comprehensive National Tobacco Regulation. *Preventive Medicine*, 45, 198-201.

Gilpin, E. A., Lee, L., & Pierce, J. P. (2004). Changes in population attitudes about where smoking should not be allowed: California versus the rest of the USA. *Tobacco Control*, 13, 38–44.

Gruber, J., & Zinman, J. (2000). *Youth smoking in the US: Evidence and implications*. Cambridge, Massachusetts: National Bureau of Economic Research Working Paper, 7780.

Hammond, D., Fong, G., Zanna, M., Thrasher, J., & Borland, R. (2006). Tobacco denormalization and industry beliefs among smokers from four countries. *American Journal of Preventive Medicine*, 31, 225 - 232.

Hamilton, W. L., Biener, L., & Brennan, R. L. (2008). Do local tobacco regulations influence perceived smoking norms? Evidence from adult and youth surveys in Massachusetts. *Health Education Research*, 23, 709 – 722.

Heilbrun, L. K., Nomura, A., & Stemmermann, G. N. (1991). The effects of nonresponse in a prospective study of cancer: 15 year follow-up. *International Journal of Epidemiology*, 20,

328-338.

Hoyle, R. H. (1995). *Structural equation modeling: Concepts, issues, and applications*. Thousand oaks, CA: Sage.

Hoyle, R. H., & Smith, G. T. (1994). Formulating clinical research hypotheses as structural equation models: A conceptual overview. *Journal of Consulting and Clinical Psychology*, 62, 429-440.

Hyland, A., Higbee, C., Hassan, L., Fong, G. T., Borland, R., Cummings, M. et al. (2007). Does smoke-free Ireland have more smoking inside the home and less in pubs than the United Kingdom? Findings from the international tobacco control policy evaluation project. *European Journal of Public Health*, 18, 63-65.

Hyland, A., Hassan, L., Higbee, C., Boudreau, C., Fong, G. T., Borland, R. et al. (in press). The impact of smokefree legislation in Scotland: Results from the Scottish ITC Scotland/UK longitudinal surveys. *European Journal of Public Health*.

International Agency for Research on Cancer (2004). *Tobacco smoking and involuntary smoking*. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, 83. Lyon (France): IARC.

Joreskog, K., & Sorbom, D. (1998). *LISREL7: A guide to the program and applications*. Chicago: SPSS Inc.

Kagan, R. A., & Skolnick, J. H. (1993). Banning smoking: Compliance without enforcement. In R. L. Rabin & S. D. Sugarman (Ed), *Smoking Policy: Law, Politics, and Culture* (pp. 69-94). New York: Oxford University Press.

Kessler, R. C., & Greenberg, D. F. (1981). *Linear panel analysis: Models of quantitative change*. New York: Academic Press.

Levy, D. T., Friend, K., & Polishchuk, E. (2001). Effect of clean indoor air laws on smokers: the clean air module of the SimSmoke computer simulation model. *Tobacco Control*, 10, 345–351.

Levy, D. T., Chaloupka, F., & Gitchell, J. (2004). The effects of tobacco control policies on smoking rates: A tobacco control scorecard. *Journal of Public Health Management and Practice*, 10, 338-353.

Opp, K. (2002). When do norms emerge by human design and when by the unintended consequences of human action? The example of the no-smoking norm. *Rationality and Society*, 14, 131–158.

Ostrom, E. (2000). Collective action and the evolution of social norms. *Journal of Economic Perspectives*, 14, 137–158.

Perkins, H. W. (1997). College student misperceptions of alcohol and other drug use norms among peers: Exploring causes, consequences and implications for prevention programs. *Designing alcohol and other drug prevention programs in higher education: Bringing theory into practice* (pp. 177–206). Newton, MA: The Higher Education Center for Alcohol and

Other Drug Prevention.

Prochaska, J. O., Redding, C. A., & Evers. K. (1997). The transtheoretical model and stages of change. In K. Glanz, F. M. Lewis and B. K. Rimer (Ed.), *Health Behavior and Health Education: Theory, Research, and Practice* (pp. 60-84). San Francisco: Jossey-Bass.

Real, K., & Rimal, R. (2007). Friends talk to friends about drinking: Exploring the role of peer communication in the theory of normative social behaviour. *Health Communication*, 22, 169-180.

Semple, S., Creely, K. S, Naji, A., Miller, B. G., & Ayres, J. G. (2007). Secondhand smoke levels in Scottish pubs: The effect of smoke-free legislation. *Tobacco Control*, 16, 127-32.

Shopland, D. R., Gerlach, K. K., Burns, D. M., Hartman, A. M., & Gibson, J. T. (2001). State-specific trends in smoke-free workplace policy coverage: The current population survey tobacco use supplement, 1993 to 1999. *Journal of Occupational and Environmental Medicine*, 43, 680-686.

Siegel, M., Albers, A. B., Cheng, D. M., Biener, L., & Rigotti, N. A. (2005). Effect of local restaurant smoking regulations on progression to established smoking among youths. *Tobacco Control*, 14, 300-306.

Siegel, M., Albers, A. B., Cheng, D. M., Biener, L., & Rigotti, N. A. (2004). Effect of local restaurant smoking regulations on environmental tobacco smoke exposure among youths. *American Journal of Public Health*, 94, 321-325.

Tauras, J. A. (2005). Can public policy deter smoking escalation among young adults? *Journal of Policy Analysis and Management*, 24, 771–784.

Tauras, J. A., & Chaloupka, F. J. (2001). Determinants of smoking cessation: An analysis of young adult men and women. In M. Grossman and C. R. Hsieh (Ed), *Economics of Substance Abuse* (pp. 337–364). Northampton MA: Edward Elgar Publishing Limited.

Trotter, L., Wakefield, M., & Borland, R. (2002). Socially cued smoking in bars, nightclubs, and gaming venues: a case for introducing smoke-free policies. *Tobacco Control*, 11, 300-304.

Wakefield, M., & Chaloupka, F. J., Kaufman, N. J., Orleans, C. T., Barker, D. C., & Ruel, E. E. (2000). Effect of restrictions on smoking at home, at school, and in public places on teenage smoking: Cross sectional study. *British Medical Journal*, 321, 333-337.

Wilson, N., Sertsou, G., Edwards, R., Thomson, G., Grigg, M., & Li, J. (2007). A new national smokefree law increased calls to a national quitline. *British Medical Journal*, 7, 75.

Table 1. Age and gender of smokers in Scotland and rest of the UK

	Scotland		Rest of UK	
	N (%)		N (%)	
Age				
	<i>Baseline</i>	<i>Follow-up</i>	<i>Baseline</i>	<i>Follow-up</i>
18-24	34 (6.7)	11 (4.1)	52 (10.3)	16 (6.2)
25-39	157 (31.0)	77 (28.5)	172 (33.9)	71 (27.6)
40-54	191 (37.7)	108 (40.0)	157 (31.0)	92 (35.8)
55+	125 (24.7)	74 (27.4)	126 (24.9)	78 (30.4)
Gender				
Female	297 (58.6)	169 (62.6)	268 (52.9)	141 (54.9)
Male	210 (41.4)	101(37.4)	239 (47.1)	116 (45.1)

Table 2. Logistic regression for gender, age and SES of respondents versus non-respondents in Scotland and the rest of the UK

	Scotland				Rest of the UK			
	OR	95% CI		<i>P</i>	OR	95% CI		<i>P</i>
Gender								
Female	1.00				1.00			
Male	1.17	.82	1.68	.39	.89	.63	1.27	.54
Age								
18-24	1.00				1.00			
25-39	.32	.18	.62	.001	.26	.14	.49	.001
40-54	.39	.24	.64	.001	.40	.24	.67	.001
55+	.66	.41	1.06	.087	.88	.52	1.51	.65
SES	.83	.65	1.06	.13	1.14	.88	1.46	.33

Table 3. Support for a ban and unacceptability of smoking across waves 1 and 2,
within and between countries

Within Country	Scotland			Rest of UK		
	Wave 1	Wave 2	<i>p</i>	Wave 1	Wave 2	<i>p</i>
Support (1-4)	2.44	2.75	.001	2.34	2.54	.001
Unacceptability (1-5)	2.21	3.27	.001	2.28	3.21	.001

Between Countries	Wave 1			Wave 2		
	Scotland	Rest of UK	<i>p</i>	Scotland	Rest of UK	<i>p</i>
Support (1-4)	2.44	2.34	.32	2.75	2.54	.01
Unacceptability (1-5)	2.21	2.28	.48	3.27	3.21	.85

Table 4. Model paths of support for ban, unacceptability and quit intentions
across Scotland and rest of UK

		Scotland		Rest of UK	
Paths		β	CR	β	CR
Unacceptability (T1) → Unacceptability (T2)		.75***	5.65	.71***	5.39
Ban (T1) →	Unacceptability (T1)	.19**	3.13	.26***	4.01
Ban (T1) →	Ban (T2)	.68***	8.87	.62***	7.74
Ban (T1) →	Unacceptability (T2)	.03	.26	-.03	-.23
Ban (T2) →	Unacceptability (T2)	.11	1.04	.26	1.79
Ban (T1) →	Quit Intentions (T2)	.21**	2.91	.16	1.79
Ban (T2) →	Quit Intentions (T2)	.14	1.73	.06	.06
Unacceptability (T2) →	Quit Intentions (T2)	.20**	2.66	.19**	2.32

*** $p < .001$, ** $p < .01$, * $p < .05$, CR-Critical ratio, T1-Baseline, T2-Follow-up.

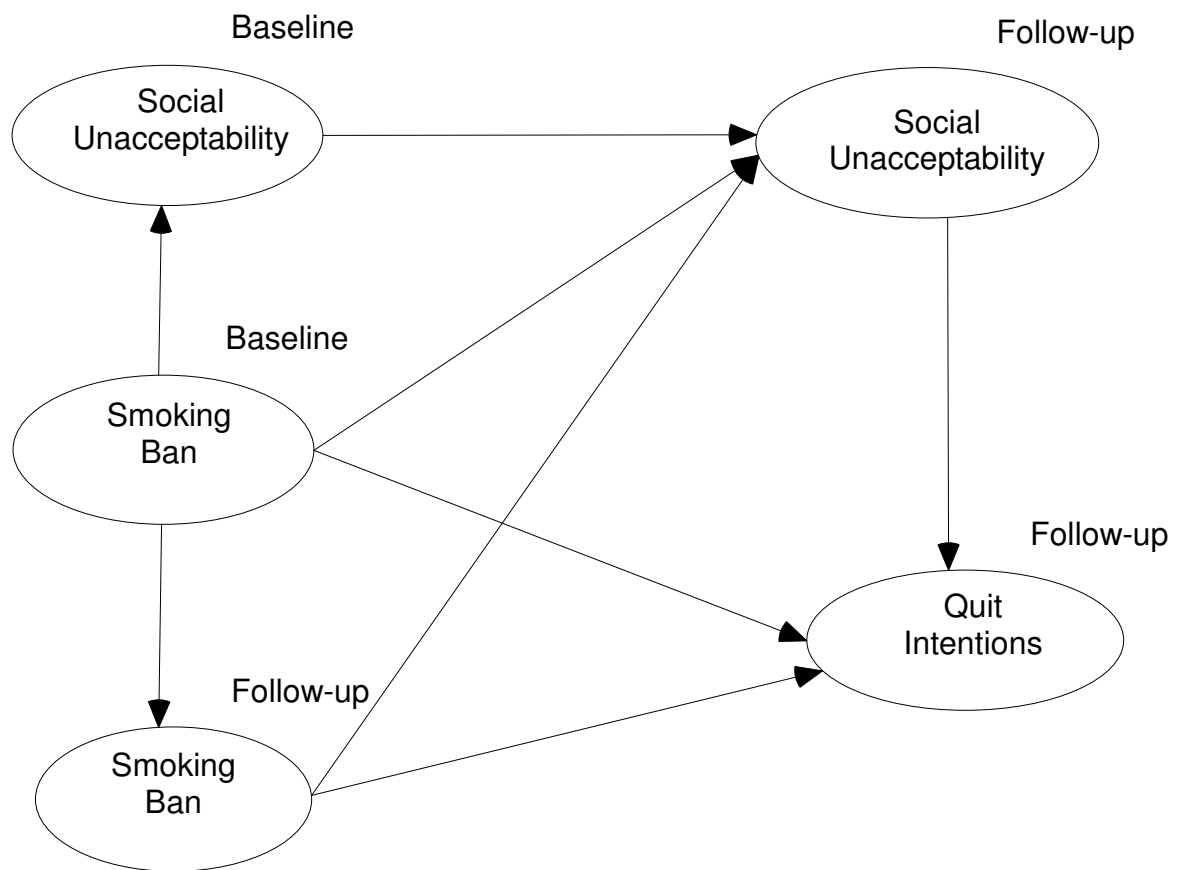


Figure 1. Hypothesized model of support for smoking ban, unacceptability and quit intentions